

CPP Trigger

David Lawrence JLab

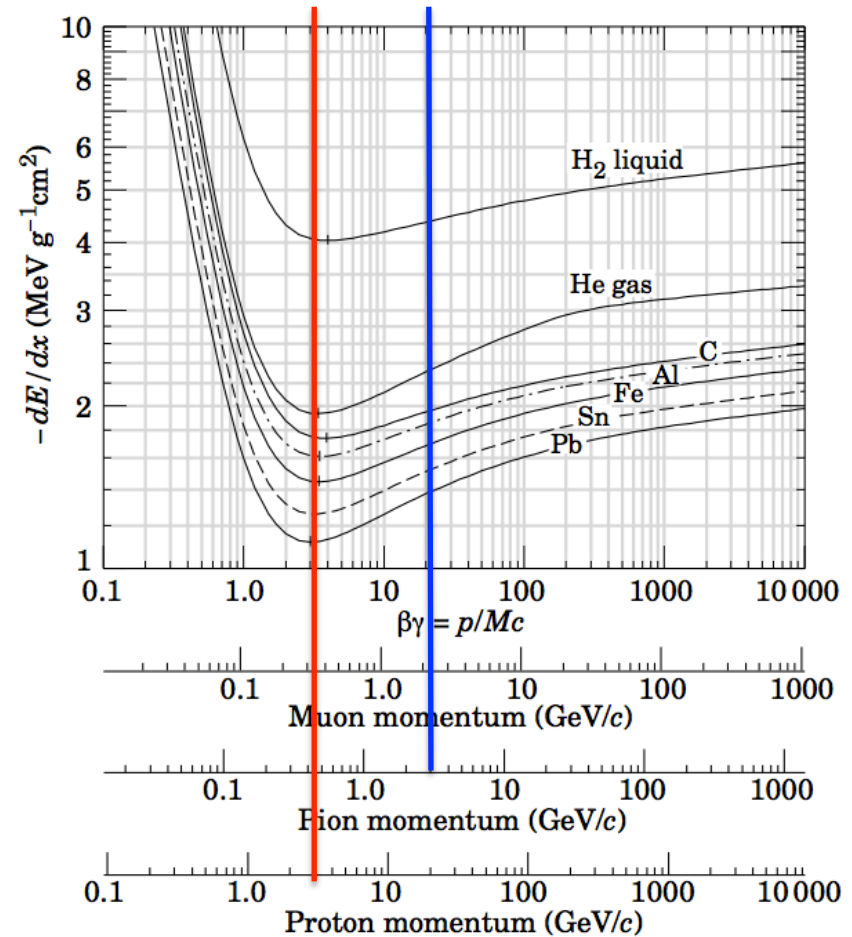
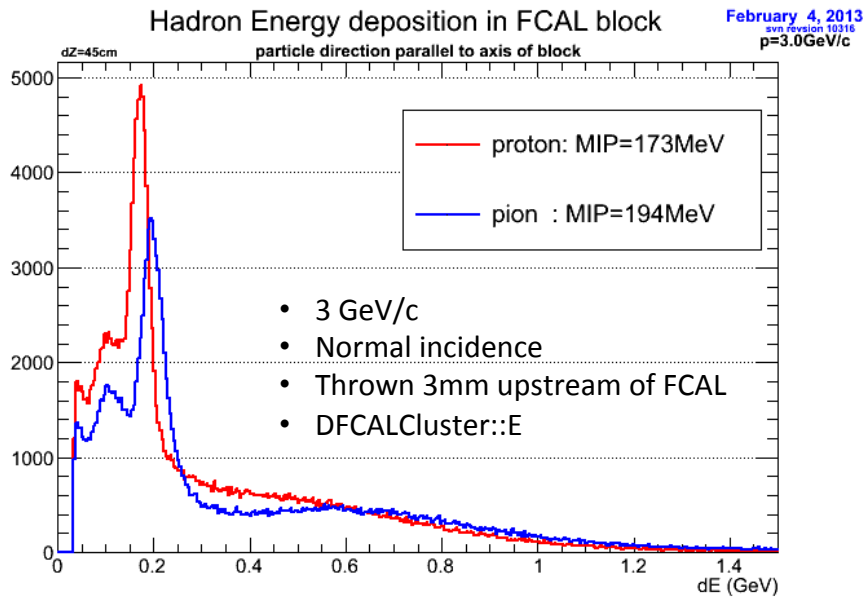
Feb. 7, 2013

FCAL response to π 's in GlueX Simulation

FCAL geometry defines active material as:
 "leadGlassF800"

Density: 3.61 g/cm³

Dimensions: 4.0 x 4.0 x 45.0 cm³



Proton:
 $dE/dx = 173/45\text{cm}/3.61\text{g/cm}^3 = 1.06 \text{ MeV g}^{-1} \text{ cm}^2$

π^+ :
 $dE/dx = 194/45\text{cm}/3.61\text{g/cm}^3 = 1.19 \text{ MeV g}^{-1} \text{ cm}^2$

Hadrons in PHENIX Calorimeter

L. Aphecetche et al. / Nuclear Instruments and Methods in Physics Research A 499 (2003) 521–536

	pions	protons
0.15 GeV/c	25MeV	-
1 GeV/c	460MeV	80MeV
4 GeV/c	540MeV	540MeV

Cerenkov threshold: $\beta_t = \frac{1}{n}$

$$p_t = m\beta_t\gamma_t = \frac{m\beta_t}{\sqrt{1-\beta_t^2}}$$

$$p_t = \frac{m}{\sqrt{1/\beta_t^2 - 1}} = \frac{m}{\sqrt{n^2 - 1}}$$

TF1 PbGlass: n=1.648

proton $p_t = 716\text{MeV}/c$

pion $p_t = 107\text{MeV}/c$

“At 500 MeV/c no significant signal is observed for protons ...”

Pbglass A2 Test Results
Electron/Pion Discrimination 1 GeV

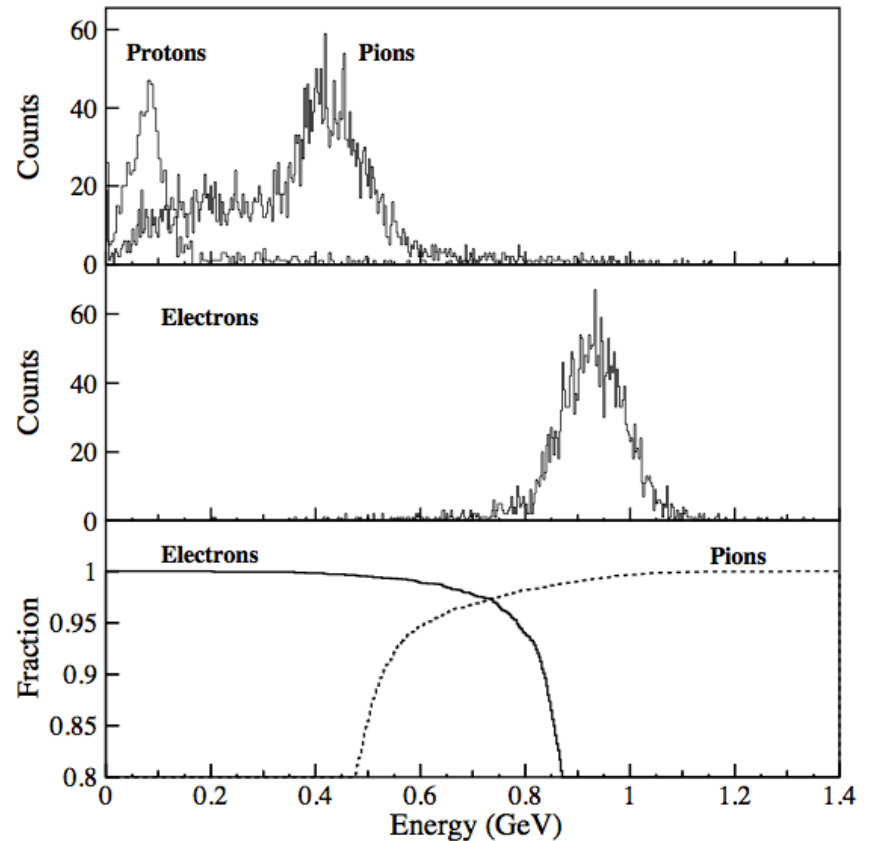


Fig. 12. Measured energy signal for protons, π^+ and e^+ of 1 GeV/c incident momentum. The lower panel shows the fraction of e^+ accepted or π^+ rejected for a varying threshold on the measured energy.

Muons and Hadrons in NOMAD

D. Autiero et al. / Nuclear Instruments and Methods in Physics Research A 387 (1997) 352–364

Calorimeter is 50cm long TF1-000 blocks

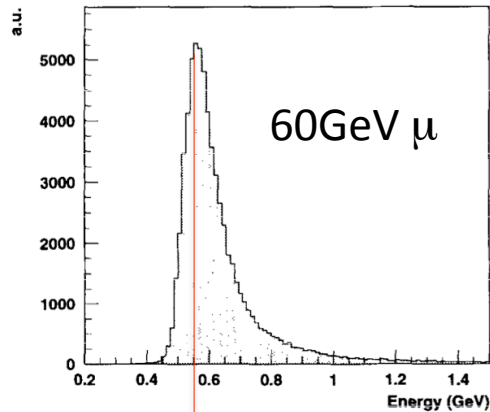


Fig. 23. Muon signal in the calorimeter.

60GeV μ gives 550MeV of apparent energy

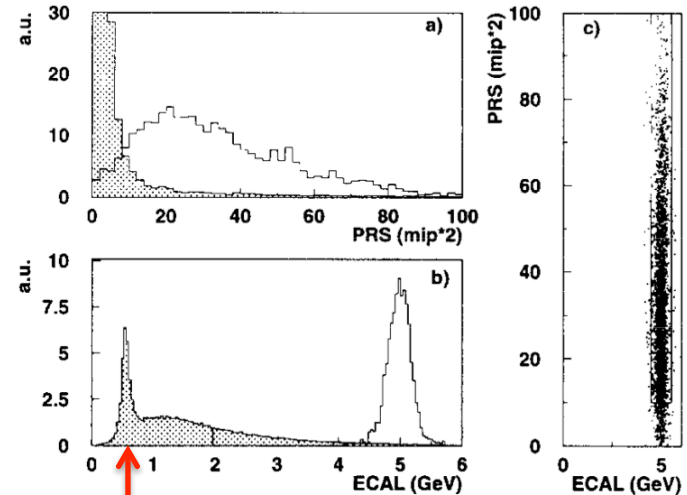


Fig. 20. 5 GeV π (shaded) and electron signals on the PRS (a) and on ECAL (b). PRS vs. ECAL signals for 5 GeV electrons (c), the limits shown in this figure define the 90% efficiency region for electrons detection.

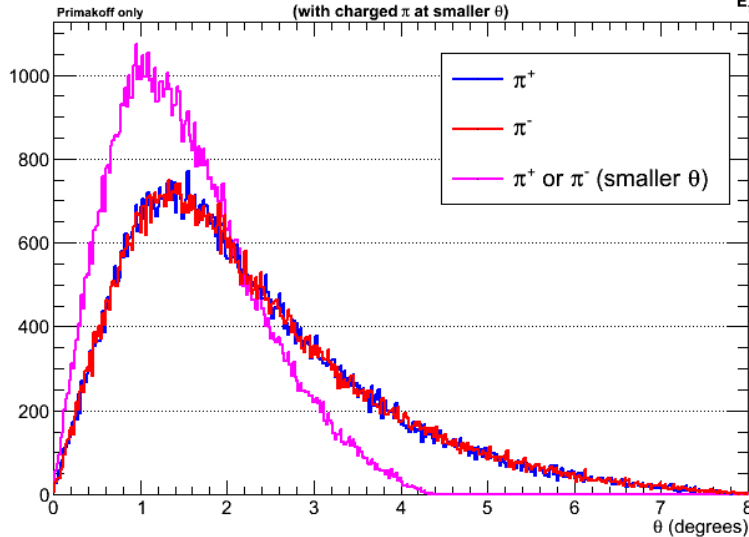
5GeV π gives \sim 550MeV of apparent energy

NOMAD blocks are 19Xo while PHENIX blocks are only 14.4Xo
NOMAD had PMTs angled at 45° wrt to block axis

Geometric Acceptance

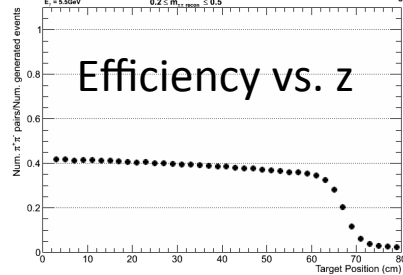
θ angle of generated π s
(with charged π at smaller θ)

February 7, 2013 DL
Sun revision 10315
 $E_e = 5.5\text{GeV}$



Rough efficiency vs. target position

January 30, 2013 DL
100k $\pi^+\pi^-$ events generated

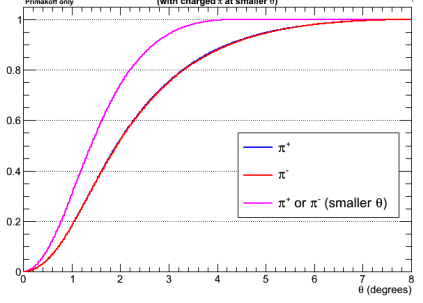


Efficiency vs. z

- Created histogram of π with lesser θ angle
- Integrated to get fraction of “fiducial” events as a function of θ

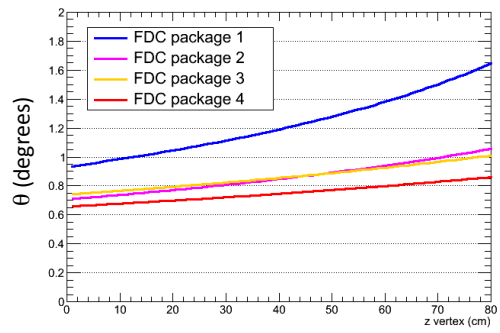
Integral of θ angle of generated π s
(with charged π at smaller θ)

February 7, 2013 DL
Sun revision 10315
 $E_e = 5.5\text{GeV}$



FDC Fiducial angle vs. z-vertex

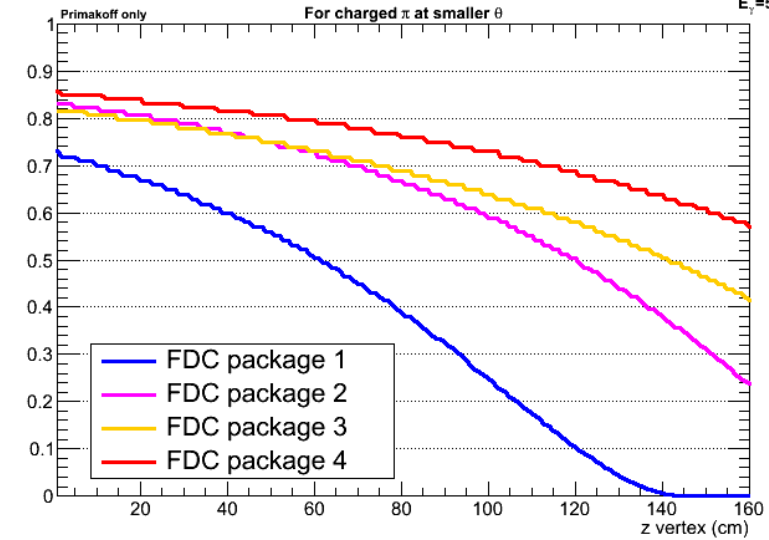
February 5, 2013 DL
Sun revision 10315



- Calculated θ for straight tracks hitting upstream layer of each package at edge of dead zone
- Mapped to integral fraction plot above to get acceptance of each package as a function of z

FDC package acceptance vs. z-vertex

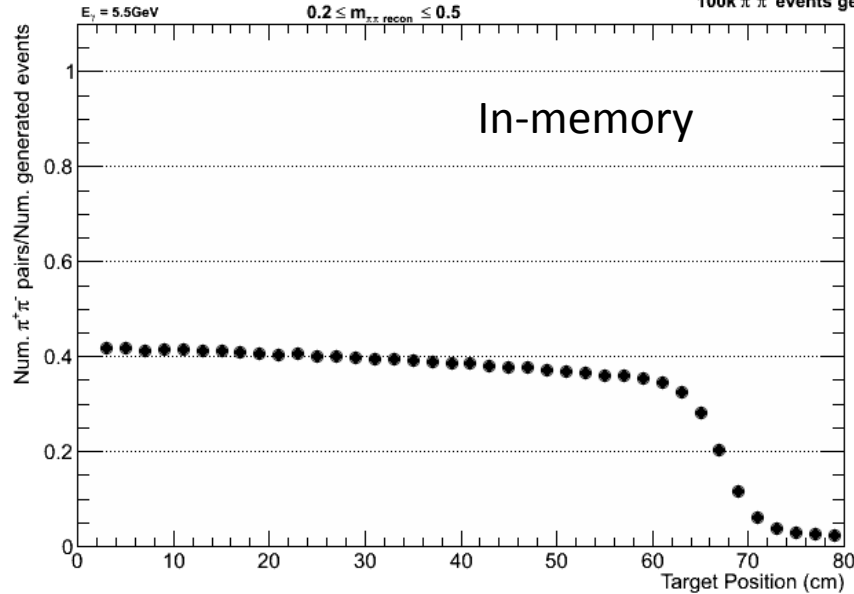
February 6, 2013 DL
Sun revision 10315
 $E_e = 5.5\text{GeV}$



Efficiency vs. Target Z

Rough efficiency vs. target position

January 30, 2013 DL
svn revision 10316
100k $\pi^+\pi^-$ events generated



Looking at $z=70\text{cm}$ events in event viewer shows lots of tracks where $K^+/-$ is most probable hypothesis

Particle topology seems different depending on whether ROOT file is created at time tracking is done or later from a REST file

(REST file is HDDDM formatted file designed specifically to hold tracking information so that it can be read back in using any standard analysis program)

Estimated efficiency vs. target position

February 6, 2013 DL
svn revision 10316
100k $\pi^+\pi^-$ events generated

